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Zeitschrift für Physik

Neu eingegangene Arbeiten

J. Jäckle, Département de Physique Théorique, Université de Genève, Switzerland:
On the Ultrasonic Attenuation in Glasses at Low Temperatures

The ultrasonic attenuation in glasses at low temperatures is calculated using the model proposed by Anderson, Halperin, and Varma. It is found that the resonant absorption of sound by the localized two-level systems saturates and can be observed only if the sound amplitude is extremely small. A second contribution to the sound absorption is derived which arises from the relaxation of the localized excitations and does not saturate. Qualitative agreement with recent measurements of the ultrasonic attenuation in fused silica is obtained.

G. Wortmann, Institut für Theoretische Physik, Abt. für Theoretische Metallphysik der Westfälischen Wilhelms-Universität, Münster:
Einfluß eines über $s-d$-Austausch angekoppelten Leitungsbandes auf einen Heisenberg-Ferromagneten (Influence of a Conduction Band on a Heisenberg-Ferromagnet via an $s-d$-Exchange Interaction)

We consider an idealized model, represented by an isotropic Heisenberg Ferromagnet, which interacts with a free electron gas via an $s-d$-exchange interaction. By decoupling the equation of motion of double-time Green's functions, we derive the system's magnon dispersion law and find an expansion in powers of the $s-d$ exchange coupling constant. The zero-order term is equal to the well-known Tjablikow result of an undisturbed Heisenberg Ferromagnet, the linear term produces a temperature dependent energy gap in the magnon spectrum, while the quadratic term proves to be responsible for kohn-like anomalies. With these results we can discuss the efficiency of the considered model, but calculation of the magnon life-times clearly shows the limits of the applied decoupling method.

K. R. Baker, J. H. Hamilton, and A. V. Ramayya, Physics Department, Vanderbilt University, Nashville, Tennessee:
Detailed Ge(Li)-Ge(Li) Coincidence Studies of Levels in ^{152}Sm and ^{152}Gd

The decay of 12.4 y ^{152}Eu to ^{152}Sm and ^{152}Gd was studied in a high resolution singles measurement and two 4096×2048 Ge(Li)-Ge(Li) coincidence studies. Forty-five gates were analyzed in order to confirm or establish the placement of the γ rays as well as to accurately determine the intensities of the 12 doublets, which included several not previously reported. A new γ-β interband transition, $4^+_\gamma \rightarrow 2^+_\beta$ (561.4 keV), a possible $3^+_\gamma \rightarrow 2^+_\beta$ (423.7 keV) transition, and a new 330.9 keV transition between the 4^+_γ level and the $I^\pi K = 3^- 0$ octupole level were established from coincidence data. Levels at 1757.0 keV in ^{152}Sm and 1282.5, 1318.7, and 1692.2 keV in ^{152}Gd are now established on the basis of coincidence data. These data also establish for the first time the population in the ^{152}Eu decay levels at 1680.0 and 1047.9 keV in ^{152}Sm and ^{152}Gd, respectively, as well as a new level at 1700.8 keV in ^{152}Sm.

Chr. Benard, Laboratoire d'Etude des Phénomènes Aléatoires — Bâtiment n° 210, Université de Paris-Sud — 91405 Orsay, France:

Operators of the Fock Space, Diagonal in the Wave-Packet Formalism and in the Mode Representation

We establish the conditions that an operator of the Fock space, diagonal in the mode representation, must verify to have a diagonal form in the wave-packet (W.P.) formalism. And we show that, if these conditions are verified, there is only one set of W.P. on which such a given operator is diagonal. The interest of these results lies in the probabilistic interpretation of a diagonal density matrix in the W.P. formalism; indeed a field described by such a density matrix may be considered as a mixture of one particle W.P. In particular our results apply to chaotic density matrices and prove that there is one way only of describing a given chaotic field as a mixture of one particle W.P.

R. Bessenrodt, Institut für Theoretische Physik der Rheinisch-Westfälischen Technischen Hochschule Aachen:

Ein kinetisches Modell für Grundgrößen der Stabilitätstheorie stationärer Zustände (A Kinetic Model for Basic Quantities in the Stability Theory of Stationary States)

A simple kinetic model which can be solved exactly is used to discuss some basic quantities in the stability theory of stationary states. In particular one microscopic and two phenomenological gains of information are introduced and compared. In addition several other properties of the theory can be illustrated.

J. Freund, Max-Planck-Institut für Plasmaphysik, Garching bei München:

Entstehung und Eigenschaften des Halo bei Pinch-Plasmen

In pinch discharges a second plasma regime called halo outside the central plasma column has been observed. This surrounding plasma was investigated in the experiments with the 5.4 m long compression coil in the ISAR I linear theta pinch because there it appears highly pronounced.

The development of the discharge was observed side-on (stereoscopic) with image converters and a streak camera. It appears possible to resolve the space-time behaviour of the plasma, especially in the dynamic phase of the discharge where the halo shows a filament like structure, by using high-speed color reversal film (streak camera). Furthermore, the smear pictures show that after 6–8 μsec the halo region is frozen into the external magnetic field, that is from this time the halo is characterized by a high electrical conductivity. The boundary layer of the halo follows a magnetic flux tube.

The parameters of the halo, such as electron density $n_e(<10^{15}\,\mathrm{cm}^{-3})$, atomic temperature T_a, and ion temperature T_i (<15 eV), were determined spectroscopically as a function of time and location from the broadening of the deuterium Balmer lines. The absolutely measured line intensities do not allow direct calculation of the electron temperature since the excited levels of the investigated Balmer lines are mainly populated from the ground level. By numerical solution of a system of rate equations describing the change of the levels a region for the electron temperature $5<T_e<10$ eV can be specified.

Different mechanisms, such as photoionization, ionization by electron impact in a time varying magnetic field, ionizing collisions of high velocity neutral atoms with neutral gas at rest, transport processes in the plasma across the magnetic field, instabilities which may cause the development of the halo, are discussed by means of the experimental results. It is concluded that the halo region is caused by flute instabilities.

H.-J. Lauter and K. Keck, Institut für Physik der Johannes Gutenberg-Universität Mainz:

Isothermal Flow of Helium II Through Plane Slits

Measurements are reported on the isothermal, gravitational flow of liquid He II through narrow plane slits. The employed superleak consists of ring-shaped Hostaphan foils packed in layers. The distance between the foils is varied by pressure. The performance of the measurements and the observance of the superfluid conditions are described. The velocity of the superfluid component of He II is calculated in dependence on the width of the slits, the temperature and the hydrostatic pressure. Especially the critical velocity is considered.

M. Pulver, Institut für Angewandte Physik, Universität Gießen:

Anisotropy of the Critical Data of Superconducting V_3Si-Single Crystals

The critical magnetic field and the critical currents in transverse magnetic fields are measured for V_3Si-single crystals with the current flowing along the [100]- and the [110]-directions of the crystal. A strong anisotropy is found for the critical current. An explanation of this behaviour may be connected with the anisotropy of the energy gap.

M. Pulver, Institut für Angewandte Physik, Universität Gießen:

Kritisches Verhalten von V_3Si und Nb_3Sn unter uniaxialem Zug im transversalen Magnetfeld

The critical data of superconductivity, i.e. temperature, magnetic field and current, were investigated on V_3Si- single crystals and V_3Si- and Nb_3Sn-diffusion wires in transverse magnetic fields under uniaxial tension. The values of all the critical parameters were reduced under the influence of the tension. A comparison of the results, obtained for the single crystals and the diffusion wires, lead to an understanding of some anomalies in the behaviour of the diffusion wire samples.

A. Delgado, J. Campos and C. Sánchez del Río, Department of Physics, University of Madrid, Madrid, Spain:

Lifetimes of Excited Levels of Kr I and Kr II

The lifetimes of eight levels belonging to the $6p$ configuration of Kr I and thirteen levels belonging to different configurations of Kr II have been measured. The levels were excited by short electron pulses of appropriate energy and the lifetimes determined by a delayed coincidence method using single photon counting techniques. All measurements were carried out at different gas pressures. The measured lifetimes of the Kr II levels are compared with other experimental results obtained by a different method (beam-foil spectroscopy) and with calculations made in the intermediate coupling scheme.

W. Wittmann, K. Tillmann, H. J. Andrä, and P. Dobberstein, I. Physikalisches Institut, Fachbereich Physik, der Freien Universität Berlin:

Fine-Structure Measurements of ^4He by Zero-Field Quantum Beats

The complete finestructure beat frequency patterns of n^3P states of ^4He I ($n=3-7$) are measured by observation of zero field quantum beats using the beam-foil technique. The results provide a new experimental value for the $7^3P_2-7^3P_0$ separation, confirm the beat amplitude ratios to be in accord with theory and allow comparison with the results of other techniques.

H.-H. Knitter, M. M. Islam, and M. Coppola, Central Bureau for Nuclear Measurements, Geel, Belgium:

Investigation of Fast Neutron Interaction with ^{235}U

The angular distribution of neutrons emitted by elastic, inelastic and fission processes on ^{235}U were measured at the incident neutron energies of 1.5, 1.9, 2.3, 4.0, 4.5, 5.0 and 5.5 MeV using nanosecond time-of-flight technique. The differential elastic scattering cross sections and their angular distributions at all the seven energies are presented. The total elastic scattering cross sections, angle and energy integrated cross sections for the inelastically scattered neutrons in energy bands of 200 keV, fission cross sections and the angular distributions of fission neutrons were extracted at 1.5, 1.9 and 2.3 MeV incident neutron energies. The energy distributions of the prompt fission neutrons and of the inelastically scattered neutrons are given at the incoming neutron energies of 1.5, 1.9 and 2.3 MeV and the average fission neutron energies and the inelastic neutron evaporation temperatures were also evaluated at these energies.

R. K. Garg, S. D. Chauhan, S. Sanyal, S. C. Pancholi, S. L. Gupta, and N. K. Saha, Department of Physics and Astrophysics, University of Delhi, India:

Half-Life Measurements in ^{59}Co, ^{141}Pr and ^{227}Ac

The half-lives of the 1291.6 keV level in ^{59}Co, 145.43 keV level in ^{141}Pr and 27.35 keV level in ^{227}Ac have been measured using leading edge and zero-crossover timing techniques. The decay curves analysed by moments, Laplace transform and slope methods gave the following half-life values:

$T_{\frac{1}{2}}$ (1291.6 keV level in ^{59}Co) = (0.538 ± 0.004) ns

$T_{\frac{1}{2}}$ (145.43 keV level in ^{141}Pr) = (1.82 ± 0.04) ns

$T_{\frac{1}{2}}$ (27.35 keV level in ^{227}Ac) = (41.0 ± 1.1) ns.

From the measured half-lives, the reduced transition probabilities $B(M1)\downarrow$, $B(E2)\downarrow$ for gamma transitions de-exciting the above mentioned levels in ^{99}Co and ^{141}Pr are determined and compared with single particle, intermediate coupling and Sorenson estimates. In ^{227}Ac, absolute transition probability for the 27.35 keV transition is determined and compared with single particle and Nilsson estimates.

H. Katzman and J. A. Mydosh, Institut für Festkörperforschung, Kernforschungsanlage, 517 Jülich, W.-Germany:

The High-Pressure Resistance-Temperature Behavior of bcc-Ytterbium

We have measured the temperature dependence of the electrical resistivity of *bcc*-Yb from 1.3 to 100 K at pressures between 50 and 160 kbar. The resistive behavior is similar to that of a "normal" metal without any indications of superconductivity or magnetic effects. The latter suggests that *bcc*-Yb is divalent.

K. Wienhard, and G. Clausnitzer, Strahlenzentrum der Justus Liebig-Universität Gießen, Institut für Kernphysik

G. Hartmann, Frieseke und Hoepfner, Erlangen:

Phase Shift Analysis of Elastic Proton Scattering by ^{12}C

Angular distributions of the polarization and cross section in ^{12}C (p, p) ^{12}C were measured at 24 energies between 9.95 and 10.90 MeV. A phase shift analysis of the data was carried out. The results show four resonances in ^{13}N at $E_x = 11.40$, 11.64, 11.67 and 11.82 MeV with spins $\frac{5}{2}^+$, $\frac{5}{2}^-$, $\frac{3}{2}^-$ and $\frac{3}{2}^+$.

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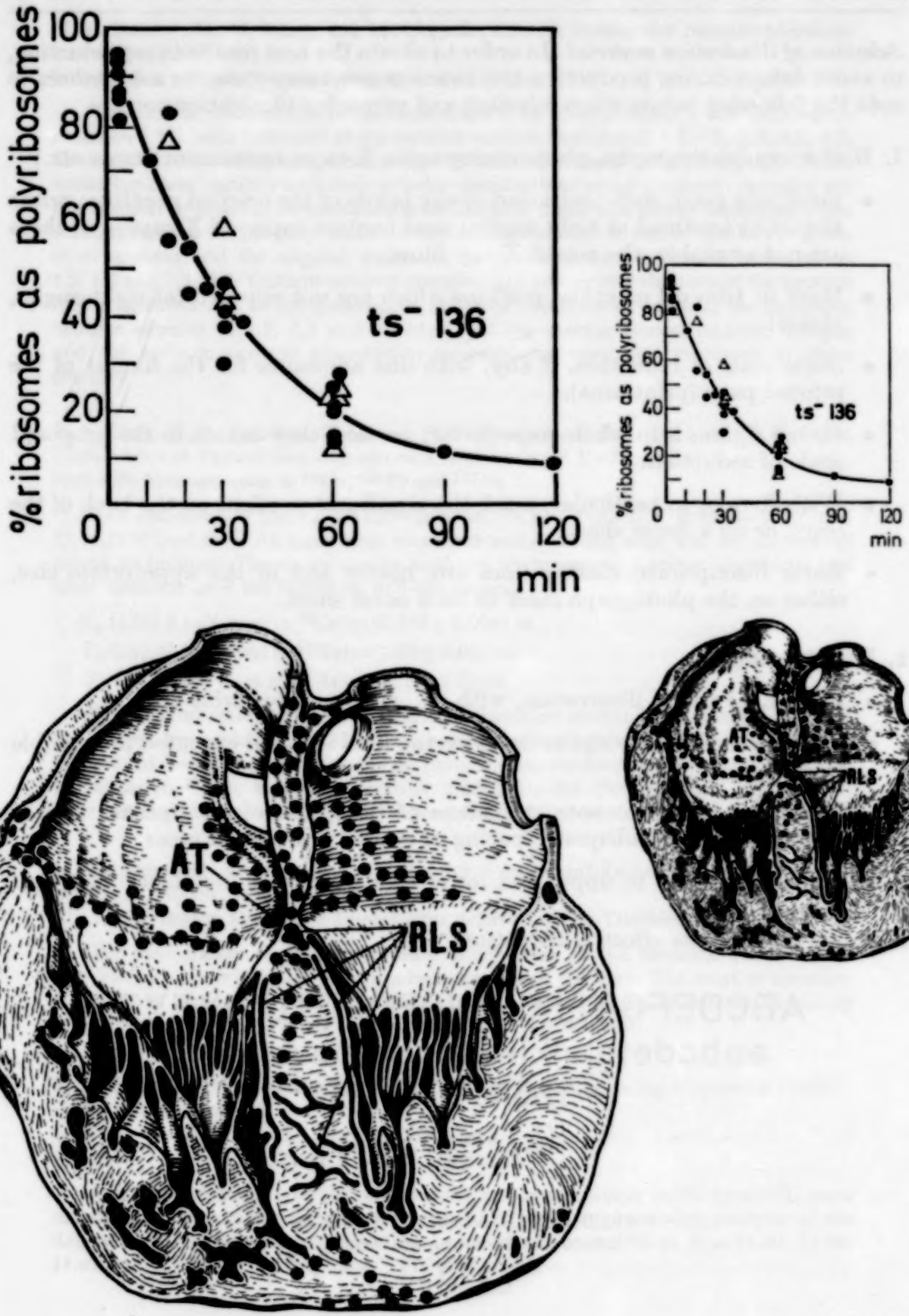

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